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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/918,853	07/30/2001	Michael A. Vyvoda	10519/29	6398

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EXAMINER
TOLEDO, FERNANDO L

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 04/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/918,853	VYVODA ET AL.	
	Examiner	Art Unit	
	Fernando Toledo	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 February 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-71* is/are pending in the application.

4a) Of the above claim(s) *25-34 and 41-54* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24,35-40 and 55-71* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 July 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *4* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of claims 1 – 24, 31 – 40 and 55 – 71 in Paper No. 7 is acknowledged.

2. Claims 31 – 34 are directed to a non-elected invention and hence they would not be examined.

3. Claims 25 – 30 and 41 – 54 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 4.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1 – 5, 7, 10 – 12, 14, 16, 18 – 20, 22, 23, 24, 35, 38 – 40, 55 – 58, 60 – 63 and 65 – 71 are rejected under 35 U.S.C. 102(e) as being anticipated by Thomas, Michael (U. S. patent 6,509,283 B1).

In re claim 1, Thomas in the U. S. patent 6,509,283 B1; figures 1 – 4 and related text, discloses, exposing an oxidizable surface to an oxidizing plasma, wherein the oxidizing plasma has an activity relative to the oxidizable surface; forming an oxide film

on the oxidizable surface; and regulating the oxidizing plasma activity to limit a rate of formation of the oxide film (Column 3).

6. In re claim 2, Thomas discloses wherein regulating the oxidizing plasma activity includes bombarding the oxidizable surface with energized ions prior to exposing the oxidizable surface to the oxidizing plasma (Column 1).

7. In re claim 3, Thomas discloses wherein bombarding the oxidizable surface includes bombarding the oxidizable surface to remove contaminants from the oxidizable surface (Column 1).

8. In re claim 4, Thomas discloses wherein bombarding the oxidizable surface includes bombarding the oxidizable surface to remove other oxide layer present on the oxidizable surface (Column 1).

9. In re claim 5, Thomas discloses wherein bombarding the oxidizable surface includes bombarding the oxidizable surface to facet the oxidizing surface (Column 1).

10. In re claim 7, Thomas discloses wherein regulating the oxidizing plasma activity includes diluting the oxidizing plasma with an inert gas (Column 2).

11. In re claim 10, Thomas discloses providing a plasma chamber; placing a substrate in the plasma chamber; and igniting the oxidizing plasma after placing the substrate in the plasma chamber (Figure 3).

12. In re claim 11, Thomas discloses further includes igniting an inert gas plasma prior to igniting the oxidizing plasma (Figure 3).

13. In re claim 12, Thomas discloses further including placing the oxidizable surface in the inert gas plasma (Figure 3).

14. In re claim 14, Thomas discloses wherein the oxidizable surface includes silicon (Figure 1).

15. In re claim 16, Thomas discloses wherein exposing an oxidizable surface to an oxidizing plasma includes exposing the oxidizable surface to a plasma including oxygen (Figure 3).

16. In re claim 18, Thomas discloses forming a semiconductor layer; exposing the semiconductor layer to a plasma including oxygen, wherein the plasma has an activity relative to the semiconductor layer; forming an oxide film on the semiconductor layer; and regulating the plasma activity to limit a rate formation of the oxide film (Column 3).

17. In re claim 19, Thomas discloses wherein the step of forming a semiconductor layer includes forming a doped semiconductor layer (Figure 1).

18. In re claim 20, Thomas discloses wherein the step of forming a semiconductor layer includes forming a silicon layer (Figure 1).

19. In re claim 22, Thomas discloses further including an electrically conductive layer prior to forming the semiconductor layer (Column 1).

20. In re claim 23, Thomas discloses wherein the oxide film includes a gate oxide layer (Column 1).

21. In re claim 24, Thomas discloses wherein the oxide film includes a passivation layer (Column1).

22. In re claim 35, Thomas discloses exposing an oxidizable surface to a plasma oxidation process for an initial exposure time; and growing an oxide film on the oxidizable surface, and wherein the plasma process is configured such that the oxide

film grows to a predetermined thickness substantially independent of an exposure time beyond the initial exposure time (Column 3).

23. In re claim 38, Thomas discloses wherein the plasma oxide process includes generating a plasma includes oxygen and an inert gas (Figure 3).

24. In re claim 39, Thomas discloses further including subjecting the oxidizable surface to a plasma containing a nitrogen species prior to exposing the oxidizable surface to a plasma oxidation process (Figure 3).

25. In re claim 40, Thomas discloses wherein subjecting the oxidizable surface to a plasma containing a nitrogen species includes subjecting the oxidizable surface to a plasma formed by a gas selected from the group consisting of nitrogen, nitrous oxide and ammonia (Figure 3).

26. In re claim 55, Thomas discloses exposing an oxidizable surface to a plasma including an oxygen species and a nitrogen species, wherein the plasma has an activity relative to the oxidizable surface; forming an oxynitride film on the oxidizable surface; and regulating the plasma activity to limit a rate of formation of the oxynitride film (Abstract and Figure 3).

27. In re claim 56, Thomas discloses wherein the nitrogen species includes a compound selected from the group consisting of nitrogen, ammonia and nitrous oxide (Figure 3).

28. In re claim 57, Thomas discloses wherein the step of forming an oxynitride film includes a gate oxide layer (Figure 1).

29. In re claim 58, Thomas discloses wherein the step of forming an oxynitride film includes a passivation layer (Figure 1).

30. In re claim 60, Thomas discloses further including subjecting the oxidizable surface to a plasma containing a nitrogen species prior to exposing the oxidizable surface to a plasma including an oxygen species and a nitrogen species (Figure 3).

31. In re claim 61, Thomas discloses wherein subjecting the oxidizable surface to a plasma containing a nitrogen species includes subjecting the oxidizable surface to a plasma formed by a gas selected from the group consisting of nitrogen, nitrous oxide and ammonia (Figure 3).

32. In re claim 62, Thomas discloses exposing an oxidizable surface to a plasma including oxygen, wherein the plasma has an activity relative to the oxidizable surface; forming an oxide film on the oxidizable surface; regulating the plasma activity to limit a rate of formation of the oxide film; and forming a silicon nitride layer overlying the oxide film (Column 3).

33. In re claim 63, Thomas discloses wherein the step of forming a silicon nitride layer includes plasma deposition of silicon nitride (Column 3).

34. In re claim 65, Thomas discloses further including subjecting the oxidizable surface to a plasma containing nitrogen species prior to exposing the oxidizable surface to a plasma including oxygen (Column 3).

35. In re claim 66, Thomas discloses wherein subjecting the oxidizable surface to a plasma containing a nitrogen species includes subjecting the oxidizable surface to a

plasma formed by a gas selected from the group consisting of nitrogen, nitrous oxide and ammonia (Column 3).

36. In re claim 67, Thomas discloses exposing an oxidizable surface to a plasma including an oxygen species, wherein the plasma has an activity relative to the oxidizable surface; forming an oxide film having an upper surface on the oxidizable surface; regulating the plasma activity to limit a rate of formation of the oxide film; and forming an oxynitride region at the upper surface of the oxide film (Column 3).

37. In re claim 68, Thomas discloses wherein the step of forming an oxynitride region includes subjecting the oxide film to a plasma containing a nitrogen plasma (Column 3).

38. In re claim 69, Thomas discloses wherein subjecting the oxide film to a plasma containing nitrogen species includes subjecting the oxide film to a plasma formed by a gas selected from the group consisting of nitrogen, nitrous oxide and ammonia (Column 3).

39. In re claim 70, Thomas discloses further including subjecting the oxidizable surface to a plasma containing a nitrogen species prior to exposing the oxidizable surface to a plasma including oxygen (Column 3).

40. In re claim 71, Thomas discloses wherein subjecting the oxidizable surface to a plasma containing a nitrogen species includes subjecting the oxidizable surface to a plasma formed by a gas selected from the group consisting of nitrogen, nitrous oxide and ammonia (Column 3).

Claim Rejections - 35 USC § 103

41. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

42. Claims 6, 9, 13, 17 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas as applied to claims 1 – 5, 7, 10 – 12, 14, 16, 18 – 20, 22, 23, 24, 35, 38 – 40, 55 – 58, 60 – 63 and 65 – 71 above, and further in view of Kwan et al. (U. S. patent 6,335,288 B1).

In re claims 6 and 17, Thomas does not teach wherein bombarding the oxidizable surface with energized ions includes subjecting the oxidizable surface to a bias voltage.

However, Kwan in the U. S. patent 6,335,288 B1; figures 1A – 3 and related text, discloses bombarding the oxidizable surface with energized ions includes subjecting the oxidizable surface to a bias voltage since the bias plasma serves to enhance the transport of plasma species (i.e. ions) created by the plasma source system to the surface of the substrate (Column 5).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to bombard the oxidizable surface with energized ions includes subjecting the oxidizable surface to a bias voltage, in the invention of Thomas, since, according to Kwan, the bias plasma serves to enhance the transport of plasma species (i.e. ions) created by the plasma source system to the surface of the substrate.

43. In re claim 9, Thomas does not teach wherein regulating the oxidizing plasma activity includes applying an RF bias voltage to the oxidizable surface.

However, Kwan discloses regulating the oxidizing plasma activity includes applying an RF bias voltage to the oxidizable surface, since; the bias plasma serves to enhance the transport of plasma species (i.e. ions) created by the plasma source system to the surface of the substrate (Column 5).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to regulate the oxidizing plasma activity includes applying an RF bias voltage to the oxidizable surface, in the invention of Thomas, since, according to Kwan, the bias plasma serves to enhance the transport of plasma species (i.e. ions) created by the plasma source system to the surface of the substrate.

44. In re claim 13, Thomas does not teach further including providing a plasma power source having an output power, and wherein regulating the oxide plasma includes limiting the output power to a predetermined level.

Kwan discloses providing a plasma power source having an output power, and wherein regulating the oxide plasma includes limiting the output power to a predetermined level, since; the bias plasma serves to enhance the transport of plasma species (i.e. ions) created by the plasma source system to the surface of the substrate (Column 5).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a plasma power source having an output power, and wherein regulating the oxide plasma includes limiting the output power to a

predetermined level, in the invention of Thomas, since, according to Kwan, the bias plasma serves to enhance the transport of plasma species (i.e. ions) created by the plasma source system to the surface of the substrate.

45. In re claim 37, Thomas does not disclose wherein the plasma oxidation process includes applying RF bias voltage to the oxidizable surface.

However, Kwan discloses wherein the plasma oxidation process includes applying RF bias voltage to the oxidizable surface, since; the bias plasma serves to enhance the transport of plasma species (i.e. ions) created by the plasma source system to the surface of the substrate (Column 5).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to applying RF bias voltage to the oxidizable surface in the invention of Thomas, since, according to Kwan, the bias plasma serves to enhance the transport of plasma species (i.e. ions) created by the plasma source system to the surface of the substrate.

46. Claims 8 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas as applied to claims 1 – 5, 7, 10 – 12, 14, 16, 18 – 20, 22, 23, 24, 35, 38 – 40, 55 – 58, 60 – 63 and 65 – 71 above, and further in view of Denison et al. (U. S. patent 5,869,149).

In re claims 8 and 36, Thomas discloses further including providing a substrate having a back surface opposite a face surface, wherein the oxidizable surface includes at least a portion of the face surface.

Thomas does not disclose wherein regulating the oxidizing plasma activity includes contacting the back surface with a cooling medium.

Denison in the U. S. patent 5,869,149; figures 1 – 6 and related text, discloses contacting the back surface with a cooling medium to prevent a rise in temperature of the substrate due to the plasma action (Column 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to contact the back surface with a cooling medium in the invention of Thomas, since, according to Denison, prevents a rise in temperature of the substrate due to the plasma action.

47. Claims 15 and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas as applied to claims 1 – 5, 7, 10 – 12, 14, 16, 18 – 20, 22, 23, 24, 35, 38 – 40, 55 – 58, 60 – 63 and 65 – 71 above, and further in view of Cleeves et al. (U. S. patent 6,541,312 B2).

In re claims 15 and 59, Thomas does not disclose wherein the oxidizable surface includes a semiconductor element of an antifuse device.

In re claims 15 and 59, Cleeves in the U. S. patent 6,541,312 B2; figures 1 – 16B and related text discloses that oxide layers can be antifuse devices (Column 10).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form an antifuse device in the invention of Thomas, since as disclosed by Cleeves, antifuse devices can be formed with oxides.

48. Claim 64 is rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas as applied to claims 1 – 5, 7, 10 – 12, 14, 16, 18 – 20, 22, 23, 24, 35, 38 – 40, 55 – 58,

60 – 63 and 65 – 71 above, and further in view of Kawakami et al. (U. S. patent 6,399,520 B1).

Thomas does not disclose wherein the step of forming a silicon nitride layer includes chemical vapor deposition of silicon nitride.

However, Kawakami in the U. S. patent 6,399,520 B1; figures 1A – 14 and related text, discloses that a high quality SiN layer can be formed, in a short time by CVD method (Column 3).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to form a silicon nitride layer includes chemical vapor deposition of silicon nitride, in the invention of Thomas, since, according to Kawakami, a high quality SiN layer can be formed, in a short time by CVD method.

49. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas as applied to claims 1 – 5, 7, 10 – 12, 14, 16, 18 – 20, 22, 23, 24, 35, 38 – 40, 55 – 58, 60 – 63 and 65 – 71 above.

In re claim 21, Thomas does not show wherein the step of forming a semiconductor layer includes forming a germanium layer.

However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to exchange silicon with germanium since it is well known in the art that germanium is a formidable semiconductor material and silicon and germanium are art recognized equivalent for the disclose intended purposes. Also, it has been held to be within the general skill of a worker in the art to select a known

material on the base of its suitability, for its intended use involves only ordinary skill in the art. *In re Leshin*, 125 USPQ 416.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fernando Toledo whose telephone number is 703-305-0567. The examiner can normally be reached on Mon-Fri 8am to 4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7382 for regular communications and 703-308-7382 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

George Fourson
Primary Examiner
Art Unit 2823

FToledo
April 18, 2003